PROC. ENTOMOL. SOC. WASH.
79(3), pp. 422–451

TWO NEW GENERA AND FOUR NEW SPECIES OF THE *PHEROCERA*-GROUP FROM WESTERN NORTH AMERICA, WITH OBSERVATIONS ON HABITATS AND BEHAVIOR (DIPTERA: THEREVIDAE: PHYCINAE)

Michael E. Irwin

Abstract.—*Schlingeria* n. gen. with *S. ammobata* n. sp., and *Parapherocera* n. gen. with *P. montana* n. sp., *P. wilcoxi* n. sp., and *P. macswaini* n. sp. are described. *Parapherocera* has a sister-group relationship with *Pherocera* Cole, and *Schlingeria* has a sister-group relationship with both *Pherocera* and *Parapherocera*. *Schlingeria ammobata* occurs in sandy areas in the Mojave and Colorado Deserts and all three species of *Parapherocera* occur in mountain ranges in California and Baja California, Mexico. The oviposition sequence of *Schlingeria ammobata* is described along with other behavioral traits.

The *Pherocera*-group of Therevidae was first studied by Cole (1923a, 1923b), who included four species in the genus *Pherocera* Cole. Subsequent studies of the group (Irwin, 1971) revealed the presence of several taxa new to science. Six of these are herein described to make their names available for the forthcoming Manual of Diptera of American North of Mexico. Descriptions, drawings and keys follow the format used recently in describing therevid flies (Irwin, 1973, 1976; Lyneborg, 1972, 1976).

Methods and Procedures

Each specimen has been assigned a unique number to facilitate the association of data. The number appears below the specimen on a separate yellow label bearing the following words in offset print: THEREVIDAE/ M. E. IRWIN/SPECIMEN #. Numbers referring to specimens will be found throughout the text and figures in italics. These numbers will be used to incorporate ecological and label data associated with the specimens into an automated data management system originally designed by Rauch (1970).

Morphological definitions can be found in Lyneborg (1968, 1972) and Irwin (1973, 1976) and a descriptive model for oviposition behavior is given by Irwin (1976).

In order to conserve space and still include as much information about each specimen as possible, the following layout was adopted for the "specimens examined" section under each species. Many of these terms are more fully explained by Stuckenberg and Irwin (1973). 1) Largest political unit

[country, or state within the United States], 2) intermediate political unit [state or province, or country within the United States], 3) smallest political unit [city or town], 4) modifer of smallest political unit [distance (km) and direction, or subunit], 5) elevation [in meters (m) above sea level], 6) year/month/day [year expressed by two digits, the "19" has been omitted since all specimens used in this study were collected in the 1900's], 7) collector(s) [acronym(s), not in parentheses, expanded below], 8) sex [♂ or ♀], 9) *specimen number* [italicized, represents adult unless otherwise stated], 10) "L" and/or "P" [these letters following the specimen number indicate that the specimen was reared from larvae or pupa and that larval (L) and/or pupal (P) exuvia are associated with the specimen], 11) depository [acronym, in parentheses, expanded below], 12) [a semicolon indicates data for previous specimen terminates and data for next specimen follows; if the subsequent specimen data listed are truncated or not complete, all data not given are identical to that for preceding specimen].

Collectors.—ALM, Melander, A. L.; AT, Tabet, A.; EIS, Schlinger, E. I.; FXW, Williams, F. X.; GIS, Stage, G. I.; GRB, Ballmer, G. R.; JCH, Hall, J. C.; JD, Doyen, J.; JW, Wilcox, J.; JWM, Macswain, J. W.; MEI, Irwin, M. E.; PAR, Rauch, P. A.; PDH, Hurd, P. D., Jr.; RCB, Bechtel, R. C.; RCD, Dickson, R. C.; RMB, Bohart, R. M.; ROS, Schuster, R. O.; and WJT, Turner, W. J.

Depositories.—AMNH, American Museum of Natural History, New York, New York; ANSP, Academy of Natural Science, Philadelphia, Pennsylvania; ASU, Arizona State University, Tempe, Arizona; BNH, Bernice P. Bishop Museum, Honolulu, Hawaii; BMNH, British Museum (Natural History), London, England; CAS, California Academy of Sciences, San Francisco, California; CIS, California Insect Survey, University California, Berkeley, California; CMNH, Field Museum of Natural History, Chicago, Illinois; CMP, Carnegie Museum, Pittsburgh, Pennsylvania; CNC, Canadian National Collection, Ottawa, Canada; CSIR, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia; CU, Cornell University, Ithaca, New York; DSIR, Department Scientific and Industrial Research, Nelson, New Zealand; DZSA, Department Zoologia, University São Paulo, Brazil; INHS, Illinois Natural History Survey, Urbana, Illinois; INIA, Instituto Nacional de Investigaciones Agricolas, Chapingo, Mexico; KUF, Kyushu University, Fukuoka, Japan; MEI, M. E. Irwin Collection; NMP, Natal Museum, Pietermaritzburg, South Africa; OSU, Oregon State University, Corvallis, Oregon; RNHL, Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands; SMN, Staatliches Museum für Naturkunde, Stuttgart, West Germany; UA, University of Arizona, Tucson, Arizona; UCD, University of California, Davis, California; UCR, University of California, Riverside, California; UK, University of Kansas, Lawrence,

Kansas; USNM, U.S. National Museum of Natural History, Washington, D.C.; USSR, Zoological Institute USSR, Leningrad, USSR; USU, Utah State University, Logan, Utah; UZM, Universitetets Zoologiske Museum, Copenhagen, Denmark; VNM, Naturhistorisches Museum, Vienna, Austria; WSU, Washington State University, Pullman, Washington.

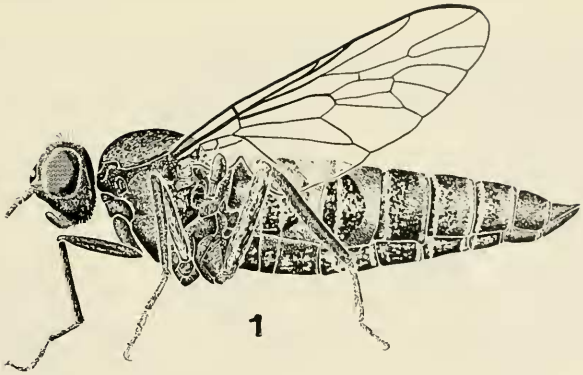
Schlingeria Irwin, new genus
(Figs. 1, 3–5, 6–7, 11–12, 19, 21, 23, 27–29, 33, 35–41)

Derivation of Name.—Named in honor of Dr. Evert I. Schlinger, Department of Entomology, University of California, Berkeley. *Gender*: Feminine. *Type-species*: *Schlingeria ammobata* Irwin, new genus, new species, by present designation. *Included species*: *Schlingeria ammobata* Irwin.

Diagnosis.—Hypognathus; compound eyes of male separated by much less than width of anterior ocellus (Fig. 5), lower facets smaller than upper facets and with a distinct line of demarkation separating facet sizes; mouthparts small, inconspicuous; antennal style 2-segmented, last of which is an inset terminal bristle (Fig. 23); scutellar setae absent; prosternum bare; anterior surface of coxa 1 with many thin setae over entire surface; ratio bt_1/bt_3 about .75; femora lacking setae; wing vein r_1 not setose (Fig. 7); wing cell M_3 closed; tergum (9+)10 of female terminalia with a few reduced, spinelike setae (Fig. 21); male terminalia lacking hypandrium; dorsal gonocoxal processes strongly connected by dorsal gonocoxal bridge (Fig. 40); paraproct not connected to dorsal apodeme of aedeagus; dorsal apodeme reduced (Fig. 28); ventral apodeme elongate, forked (Fig. 27).

Description.—Medium bodied flies; length excluding antennae 4.5–7.5 mm; females larger and heavier than males.

Head: Hypognathus; frons of male at its narrowest much narrower than width of anterior ocellus (Fig. 5); frons of female at level of anterior ocellus about 2× as wide as ocellar tubercle (Fig. 3); head about ¾ as high as wide; distance between eyes at lower corners of compound eyes about equal to head height (90–115%); compound eyes of female small, of uniform facet size; those of male large, with lower facets smaller than upper facets and a distinct demarkation line separating 2 facet sizes (Fig. 5); antennal insertion low (♂), about ⅔ distance from vertex to genae or antennal insertion about midway between vertex and genae (♀); frons at antennal insertion 25–35% (♂) or 50–60% (♀) as wide as head; proboscis very short, partially concealed in oral cavity; palps 1-segmented, thin, sparsely covered with fine hairs (Fig. 11); antennae about ¾ as long as head depth; antennal style 2-segmented, last of which is a partially recessed terminal bristle (Figs. 12, 23); frons of female with a large shiny callus, frons of male lacking callus or callus very small; ocellar and post-



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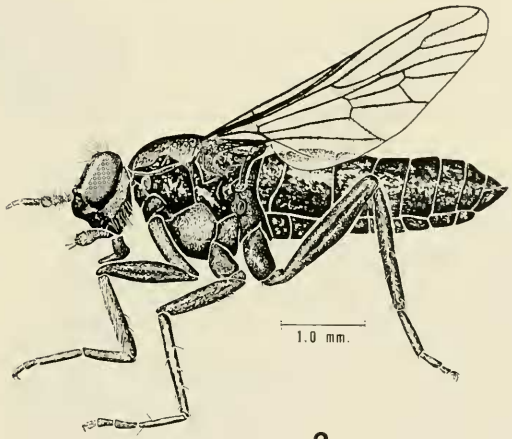

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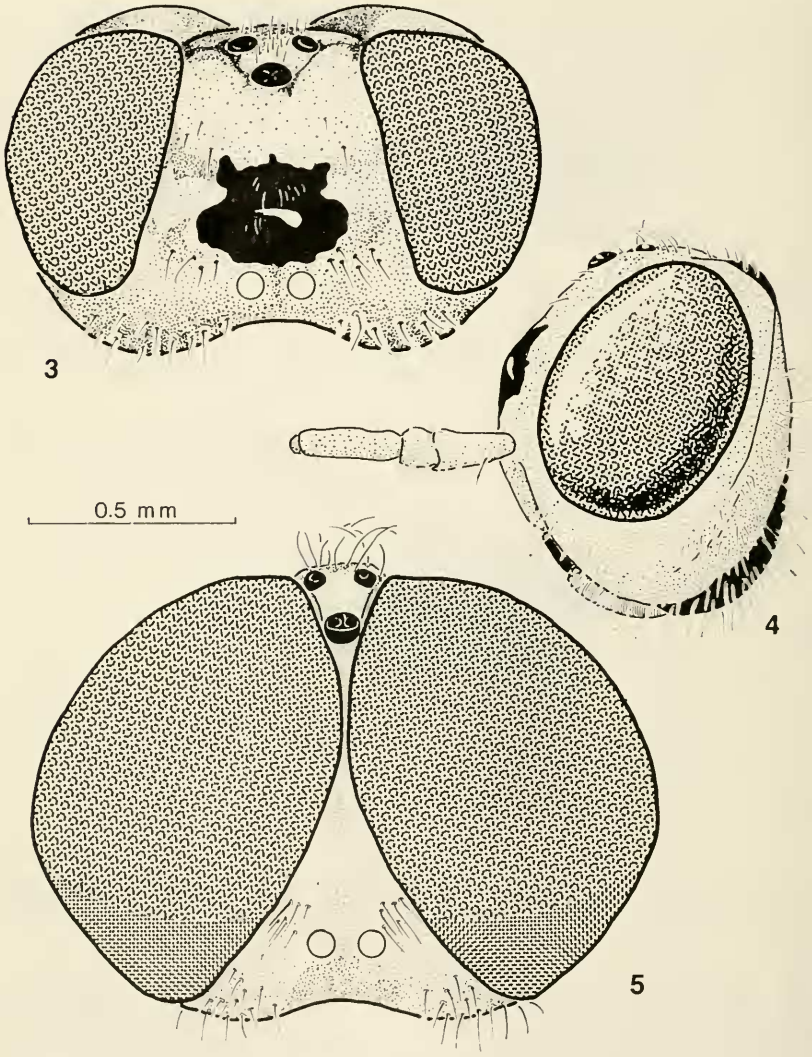
Figs. 1–2. Lateral view of flies. 1, *Schlingeria ammobata* (2855). 2, *Paraphorocera montana* (1116).

ocellar hairs present and long; occipital setae absent, or at most a few lateral of postocellar hairs.

Thorax: Mesonotum nearly as wide as long (excluding length of scutellum); mesontal setae pattern: *np* usual 3 (from 3–4), *sa* always 1, *pa* always 1, *dc* from 0 to 1, *sc* always 0; prosternum without pile.

Wing (Fig. 6): Vein r_1 not setose (Fig. 7); cell M_3 closed; r_4 slightly longer than r_5 and distance from outrun of r_4 to outrun of r_5 about ½ as long as length of r_5 (Fig. 6).

Legs: Coxa 1 with many (10–30) thin short setae over entire anterior surface; posterior surfaces of coxae 1 and 2 very sparsely tomentose, not pilose; femora without setae; tibia 1 without setae; tibia 2 lacking setae



Figs. 3–5. Head of *Schlingeria ammobata*. 3, female (282), dorsofrontal view. 4, female (282), lateral view. 5, male (233), dorsofrontal view.

in *pd* and *pv* positions, with none to a few in *av* position and with none to many (15) in *ad* position; tibia 3 lacking setae in *ad*, *pd* and *pv* positions, with several (4–8) in *av* position; males with more tibial setae than females; bt_1 about ¾ as long as bt_3; tibia 1 not swollen, thinner than tibia 3.

Abdomen: Abdomen of female swollen, wider than high, tapering

sharply to apex (Fig. 1); abdomen of male smaller, cylindrically-shaped and gradually tapering to apex.

Female Terminalia: Vaginal apodeme (*fur*, Fig. 21) thick, the anterior portion closed and posterior portion open, horseshoe-shaped; 3 unsclerotized spermathecae (*sp*, Fig. 21); subanal plate (*su*, Fig. 21) with sparse thin setae; tergum (9+)10 with a few reduced, spinelike setae (*t(9+)10*, Fig. 21). Penial guide anteriorly fused with thickened transverse band on sternum 8 (Fig. 21).

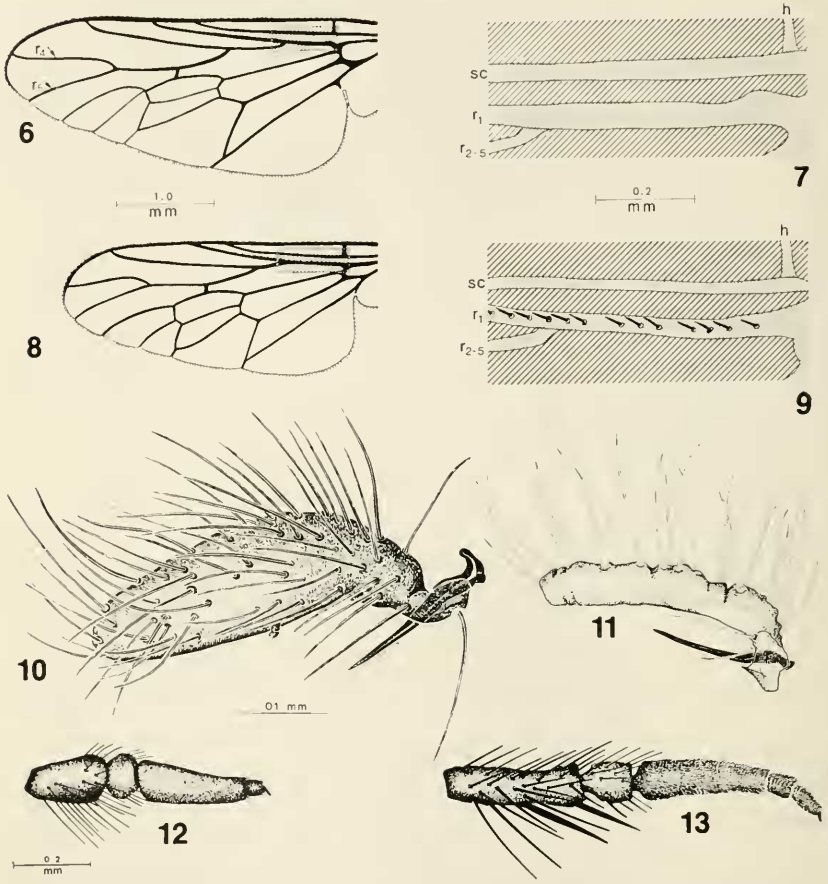
Male Terminalia: Sternum 8 (*s8*, Figs. 35, 36) somewhat rounded; tergum 8 bilobate (*t8*, Figs. 35, 37); epandrium much wider than long, situated over posterodorsal portion of gonocoxite (*e*, Figs. 35, 38); cercus slightly bilobate, both halves solidly joined, extending slightly beyond paraproct (*c*, Fig. 39); paraproct shield-shaped, not attached to dorsal apodeme of aedeagus or dorsal gonocoxal bridge of gonocoxite, with thickened, short setae (*p*, Fig. 39); gonocoxites rounded, not joined together ventrally, with 2 spinelike projections at the inner lateral posterior margin of each gonocoxite (*g*, Fig. 41); hypandrium completely lacking; dorsal gonocoxal processes (*dgp*) bulbous and strongly connected by dorsal gonocoxal bridge (*dgb*); dorsal gonocoxal rods (*dgr*) jut anteriorly, but do not exceed gonocoxal shell (Fig. 40); stylus short, not extending to tip of phallus, squat, with sharp point projecting outward and upward (*st*, Figs. 35, 40, 41); aedeagus (Figs. 27, 28) rather short and squat; ventral apodeme (*va*) elongate, reaching anteriorly almost to apex of ejaculatory apodeme; dorsal apodeme (*da*) reduced; ejaculatory apodeme (*ea*) moderately long; phallus (*ph*) curved and slender.

Phylogenetic Placement.—Schlingeria, from material I have examined, appears to be more closely related to two New World genera than to any of the related genera forming the Rueppelliine group of the Old World. In fact, *Schlingeria* appears to form a sister-group relationship with both *Parapherocera* Irwin and *Pherocera* Cole. *Schlingeria* can be characterized by the following apomorphic character states: Wing vein r_1 not setose, scutellum not setose, compound eyes of males with a dividing line between 2 distinct omatidia sizes, paraproct not united with dorsal apodeme of aedeagus, mouthparts very reduced, tergum (9+)10 with only a few reduced setae, hypandrium lacking.

Schlingeria ammobata Irwin, new species

Derivation of Name.—ammos (Gr.) = sand; *bates* (Gr.) = walker.

Description.—Female, holotype, see number 2855 in Table 1 for linear measurements. Ground color dark brown to black with portions of body and legs yellow to reddish yellow; pile short, sparse, white to yellowish white over most of body; tomentum silvery, moderately dense.



Figs. 6–7. Wings of *Schlingeria ammobata* (*237*). 6, whole wing. 7, portion of radial sector, as shown in Fig. 6 (darkened area). Figs. 8–9. Wings of *Parapherocera montana* (*4047*). 8, whole wing. 9, portion of radial sector, as shown in Fig. 8 (darkened area). Figs. 10–11. Maxillary palps of males, lateral view. 10, *Parapherocera montana* (*1155*). 11, *Schlingeria ammobata* (*237*). Figs. 12–13. Antennae of males, lateral view. 12, *Schlingeria ammobata* (*237*). 13, *Parapherocera montana* (*1155*). h = humeral vein; r_1 = radial vein 1; r_{2-5} = radial veins 2–5; r_4 = radial vein 4; r_5 = radial vein 5; sc = subcostal vein.

Head: Ground color black. Pile on frons sparse, short, white, longer and denser on face and genae (Fig. 3); ocellar and postocellar hairs fairly long, white, thin but dense. Dorsal occipital setae lacking or very reduced. Tomentum silver, densely covering entire head except for large frontal callus (Fig. 3), lower genae and occiput. Minimal distance between compound eyes located at hind ocelli. Compound eyes relatively small

(Figs. 3, 4). Frontal callus covering most of central frons, shiny black, with longitudinal striae; lower central area depressed giving appearance of 2 raised humps. Genal width 0.26 mm. Antennal segments dark brown, I and II with long white hairs mostly ventrally and laterally. Antennae 65–85% as long as head depth, golden to brown tomentose, with short, appressed, golden hairs. Segment I about 2× as long as wide; segment II slightly wider than long; segment III elongate blunt, slightly more than 3× as long as wide. Ratio of lengths of segments I/II/III about 2 1/3. Basal segment of style large, terminal bristle not visible except under high magnification (Fig. 23). Proboscis brown, small; palps brown with sparse, long, white hairs, only reaching ⅔ distance to apex of proboscis.

Thorax: Ground color of mesonotum with a central and a lateral pair (1 per side) of sparsely tomentose vittae surrounded by dense, silvery tomentum. Vittae fading posteriorly. Scutellum laterally and posteriorly densely tomentose, medially and anteriorly bare. Pile of mesonotum and scutellum thin, erect, longer posteriorly, slightly appressed, shorter anteriorly; white (about 0.14 mm long). Mesonotal setal pattern: *np* = 3, *sa* = 1, *dc* = 1, *sc* = 0. All setae yellowish white. Pteropleurite bare of tomentum; sternopleurite and pleurotergite sparsely tomentose; rest of pleurae and coxae densely silvery tomentose. Pile thin, sparse, elongate, white on anepisternum, pteropleurite and pleurotergite.

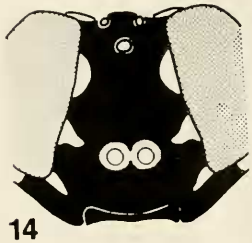
Wing (Figs. 6, 7): Veins yellowish tan, hyaline infuscate with no darkened areas. $Medial_3$ joining m_4 0.22 mm before wing margin. Haltere with pale tan stem and white knob; stem 0.03 mm long; knob 0.40 mm long.

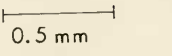
Legs: Femora dark brown to black with apices yellowish tan. Tibiae whitish yellow. Ratio bt_1/bt_3, 0.73; tarsi yellow basally grading to dark brown distally. Setae pale yellow; hairs whitish. Tibial setal pattern: t_1 [0], t_2 [*ad* = 2, *av* = 0, *pd* = 0], t_3 [*ad* = 0, *av* = 4, *pd* = 0, *pv* = 0].

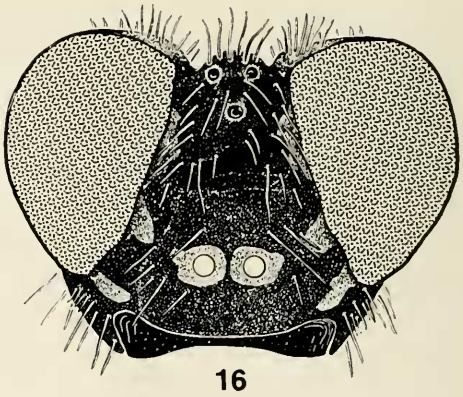
Abdomen: Ground color dark brown to black; lateral and dorsolateral portions of terga 2 and 3 (slightly on 1) yellowish orange. White fascia on posterior margins of terga 1–5 (slightly on 6). Pile thin, sparse, short, white over most of abdomen, longest, densest laterally. Tomentum sparse, silvery-gray, denser dorsolaterally and posteriorly.

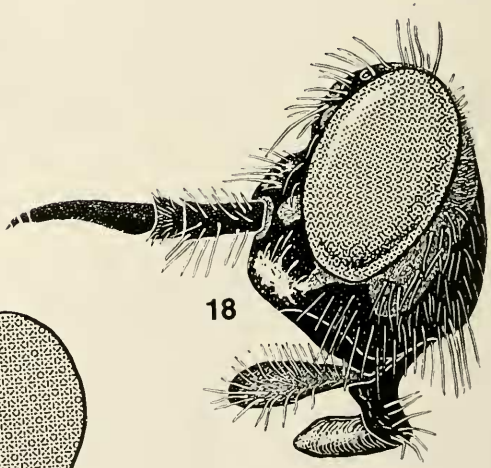
Terminalia (Figs. 19, 21): As described in generic description.

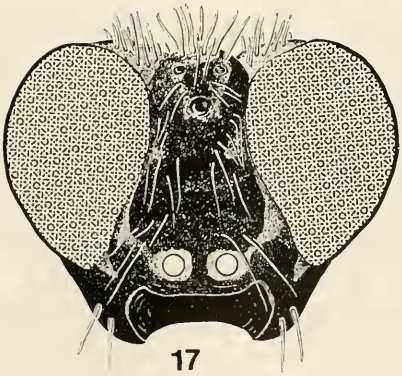
Female Variation.—See Table 1, numbers *248*, *255*, *266*, *282* for linear measurements. Females similar to one another with the following exceptions. Size varies greatly. Specimen number *266* is about 5.6 mm long; number 258 is 7.8 mm long, excluding antenna. Antennal segment I approximately 60–75% as long as segment III. Frontal callus varying in size and shape depending upon amount of tomentum worn off of specimen (Fig. 3, number 282 typical). Mesonotal setal pattern fairly constant, specimen number 255 with 4 *np* setae. Wing veins often disappear toward wing margin, and sometimes coalesce in odd ways, especially apically from discal cell.

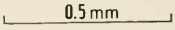




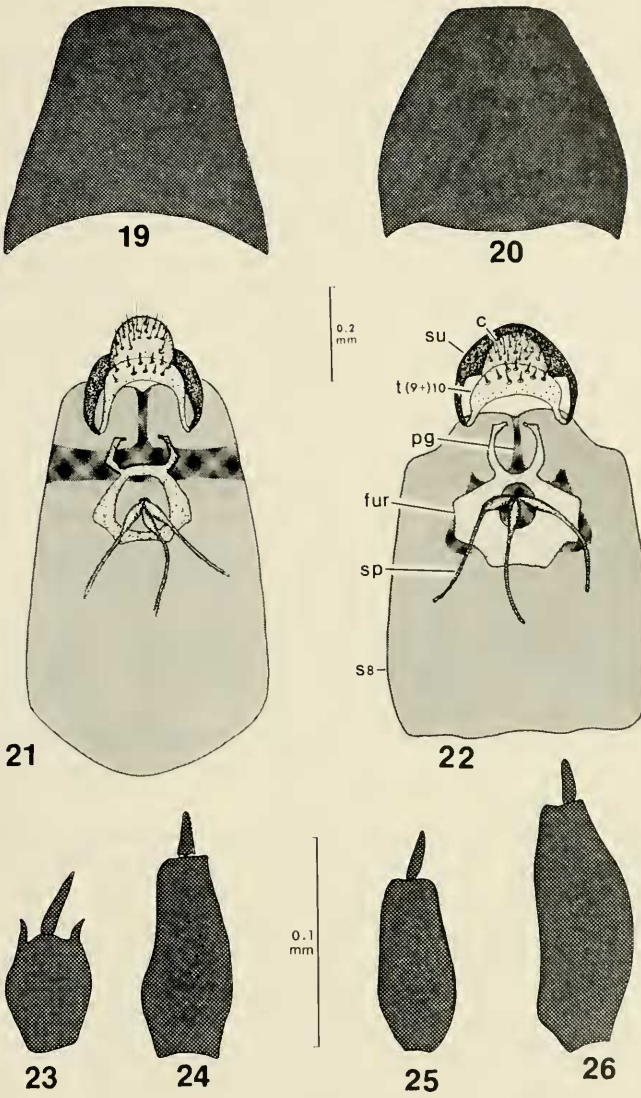








Figs. 14–15. Dorsofrontal view of head. 14, *Parapherocera macswaini* female, holotype (*1188*). 15, *P. wilcoxi* female, holotype (*1180*). Figs. 16–18. Head of *P. montana*. 16, female (*116*), dorsofrontal view. 17, male (*1135*), dorsofrontal view. 18, female (*1116*), lateral view.



Figs. 19–22. Female terminalia, dorsal views. 19, tergum 8, *Schlingeria ammobata* (282). 20, tergum 8, *Parapherocera montana* (1125). 21, sternum 8 and postgenital segments, S. *ammobata* (282). 22, sternum 8 and postgenital segments, *P. montana* (1125). Figs. 23–26. Penultimate segment and terminal bristle of male antennal style, lateral view, venter to right. 23, *Schlingeria ammobata* (237). 24, *Parapherocera montana* (1155). 25, *P. wilcoxi* (1168). 26, *P. macswaini* (1184). c = cerus; fur = furca; pg = penial guide; s8 = sternum 8; sp = spermatheca; su = subanal plate; t(9+)10 = tergum (9+)10.

Length of coalesced m_{3+4} from 0.16 to 0.22 mm. Ratio bt_1/bt_3 from 0.71 to 0.78. Tibial setae vary as follows: t_2 [*ad* = 0–2, *av* = 0–2], t_3 [*av* = 4–5]. Abdominal color pattern varies somewhat, from orange to yellow orange. The orange colored area usually includes most to all of terga 2 and 3, but sometimes includes most of tergum 1 and portions of terga 4 and 5.

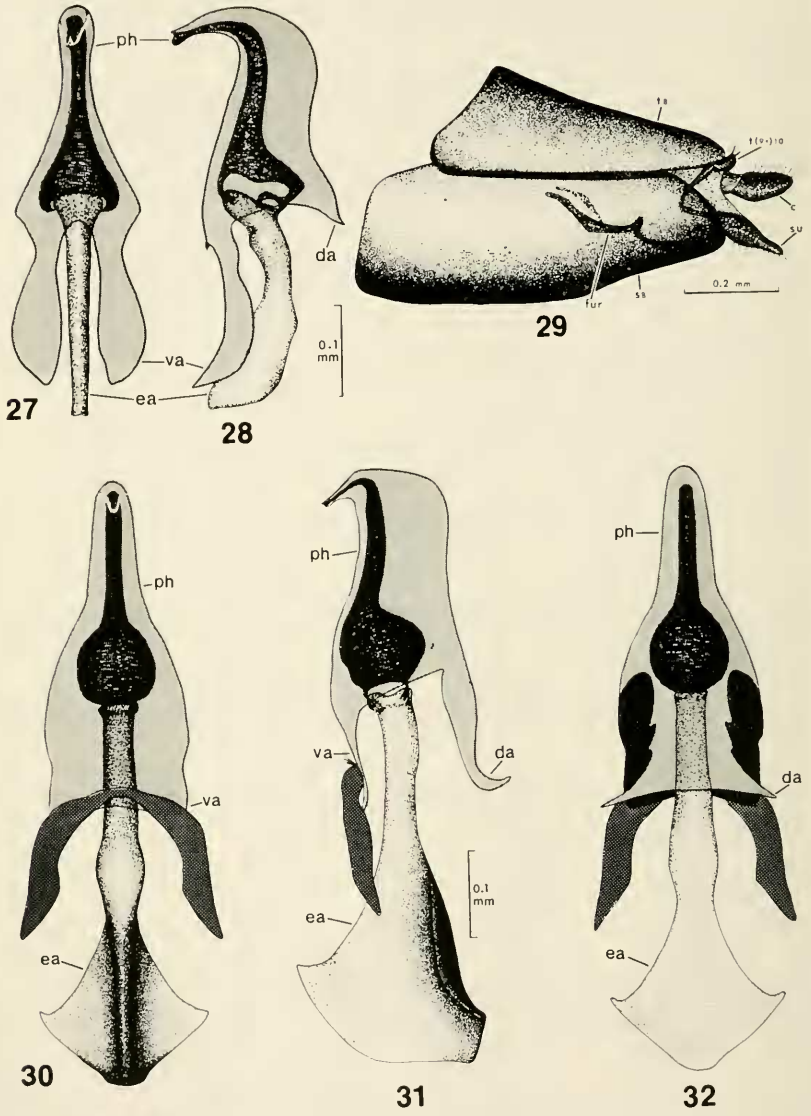
Male Description and Variation.—See Table 1, numbers *200, 210, 212, 221, 224* for linear measurements. Males similar to females except as follows: Males holoptic and head and compound eyes much larger than female in proportion to body length. Minimal distance between compound eyes from 0.01–0.02 mm, always less than width of anterior ocellus and situated at upper frons below anterior ocellus (Fig. 5). Frontal callus nonexistent to thin, longitudinally placed, from antennal sockets to area between compound eyes. Antennal segment I 40–65% as long as segment III. Pile considerably longer in males than females. Mesonotal setae: *np* 3–4, *sa* 1, *pa* 1, *dc* 0–1, *sc* 0. Coalesced vein m_{3+4} from 0.10 to 0.26 mm long. Tibial setal pattern: t_1 [0], t_2 [*ad* = 6–14, *av* = 0, *pd* = 0, *pv* = 0], t_3 [*ad* = 0, *av* = 4–7, *pd* = 0, *pv* = 0]. Abdomen usually lacking orange coloration, occasionally some orange appears on lateral edges of terga 2 and 3.

Male Terminalia (Figs. 27–28, 35–41): As depicted under generic description. Ground color brown with white hairs. Sternum 8 (Fig. 36) with short hairs restricted to posterior ⅓, most confined to posterior margin; tergum 8 (Fig. 37) with longer hairs restricted to lateral portions; epandrium (Fig. 38) 0.42 mm wide, 0.12 mm long (measured medially longitudinally and latitudinally), with short hairs mostly confined to posterolateral portions; paraproct sclerotized, rounded apically with thick, very short hairs, scattered on ventral surface. Cerci united to one another and by thin membrane to posterior margin of epandrium, with comparatively elongate hairs covering most of the dorsal surface, slightly bilobate; cerci extending slightly beyond paraproct; gonocoxites (Figs. 40, 41) moderately large, rounded; stylus blunt, short, curved inward, with outward directed point, and with thin, elongate hairs on outer dorsal surface; gonocoxite with 2 to 3 thickened, short spines on posterior margin just ventral of stylus. Distal portion of dorsal gonocoxal process bulbous, basal portion strongly connected to dorsal gonocoxal bridge (Fig. 40). Aedeagus as illustrated (Figs. 27, 28); shape of the phallus varies somewhat, being fuller in some (237) than depicted (*241*).

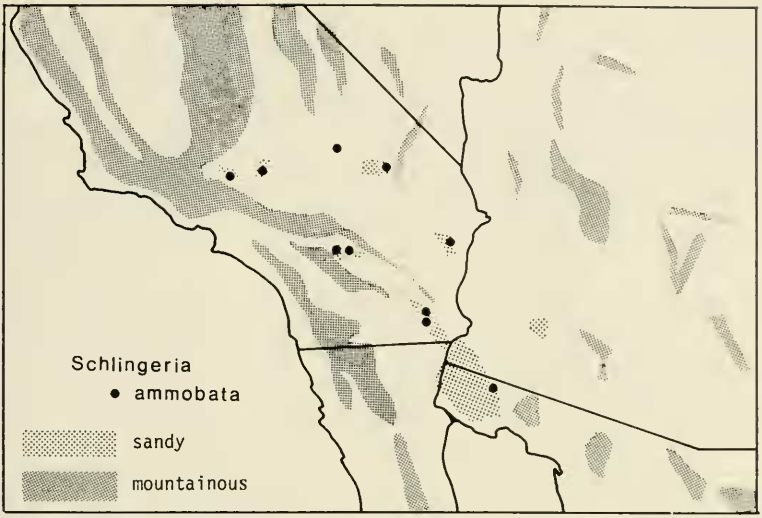
Distribution and Ecological Placement.—Schlingeria ammobata occurs throughout most of the Colorado and the southern portions of the Mojave Deserts of California and extends southward into the Sonora Desert of Mexico (Fig. 33). The species has been collected in the inland deserts, always in close association with shifting (and sometimes stable) sand dune environments and often associated with the following plant genera: *Cercidium, Larrea* and *Prosopis*.

Table 1. Measurements in mm.

Species	*Schlingeria ammobata* Irwin									
Type	PARA	PARA	PARA	PARA	PARA	HOLO	PARA	PARA	PARA	PARA
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
No.	*221*	*210*	*212*	*224*	*200*	*2855*	*282*	*266*	*255*	*248*
Total length, excluding antennae	4.7	5.4	6.1	5.5	5.3	6.9	5.8	5.6	6.7	6.8
Head width	1.40	1.56	1.80	1.62	1.64	1.36	1.36	1.30	1.52	1.50
Head height	1.16	1.20	1.32	1.20	1.26	1.04	1.00	.96	1.22	1.12
Head depth	.80	.80	.90	.80	.80	.80	.70	.75	.90	.82
Distance between eyes at vertex	.22	.26	.30	.26	.24	.52	.44	.46	.60	.52
Frontal width at anterior ocellus	.10	.10	.10	.10	.10	.50	.50	.48	.58	.56
Frontal width at antennae	.46	.46	.52	.50	.44	.76	.72	.76	.88	.84
Facial width at lower edge of eye	1.04	1.06	1.26	1.08	1.16	1.12	.90	.84	1.30	1.24
Eye height	.98	1.00	1.16	1.00	1.06	.72	.68	.64	.82	.70
Eye depth	.72	.70	.76	.74	.70	.56	.48	.42	.56	.54
Frontal protuberance depth	.00	.00	.00	.00	.00	.10	.06	.06	.10	.10
Antennal segment I length	.12	.16	.18	.18	.20	.20	.20	.18	.24	.20
Antennal segment III length	.32	.34	.36	.34	.30	.34	.30	.30	.32	.32
Mesonotal length (excluding scutellum)	1.16	1.44	1.60	1.34	1.40	1.38	1.32	1.24	1.60	1.40
Mesonotal width	1.16	1.28	1.46	1.26	1.34	1.18	1.26	1.10	1.44	1.30
Wing length (humeral crossvein to apex)	2.72	3.14	3.56	3.20	3.16	3.40	3.22	3.12	3.58	3.64
Wing width (maximum)	1.30	1.30	1.62	1.30	1.40	1.44	1.26	1.24	1.50	1.48
Distance fork r_{4+5} to outrun r_4	.88	.94	1.04	1.00	.90	1.02	.90	.90	1.00	1.10
Distance fork r_{4+5} to outrun r_5	.80	.82	.90	.92	.80	.92	.84	.70	.94	.98
Distance outruns r_4 to r_5	.38	.40	.48	.40	.42	.44	.48	.40	.46	.50
Coxa 1 length	.50	.60	.62	.54	.52	.64	.54	.54	.70	.58
Tibia 1 length	.84	1.00	1.06	1.02	.94	1.06	1.04	.94	1.14	1.14
Tibia 3 length	1.28	1.42	1.66	1.40	1.50	1.60	1.52	1.56	1.90	1.80
Basitarsus 1 length	.38	.42	.44	.40	.42	.44	.42	.40	.50	.48
Basitarsus 3 length	.50	.52	.60	.54	.56	.60	.56	.56	.64	.62



Figs. 27–28. Aedeagus of *Schlingeria ammobata* (*241*). 27, ventral view. 28, lateral view. Fig. 29. Female terminalia of *Schlingeria ammobata* (232), lateral view. Figs. 30–32. Aedeagus of *Parapherocera montana* (*1155*). 30, ventral view. 31, lateral view. 32, dorsal view. c = cercus; da = dorsal apodeme; ea = ejaculatory apodeme; fur = furca; ph = phallus; s8 = sternum 8; su = subanal plate; t8 = tergum 8; t(9+)10 = tergum (9+)10; va = ventral apodeme.



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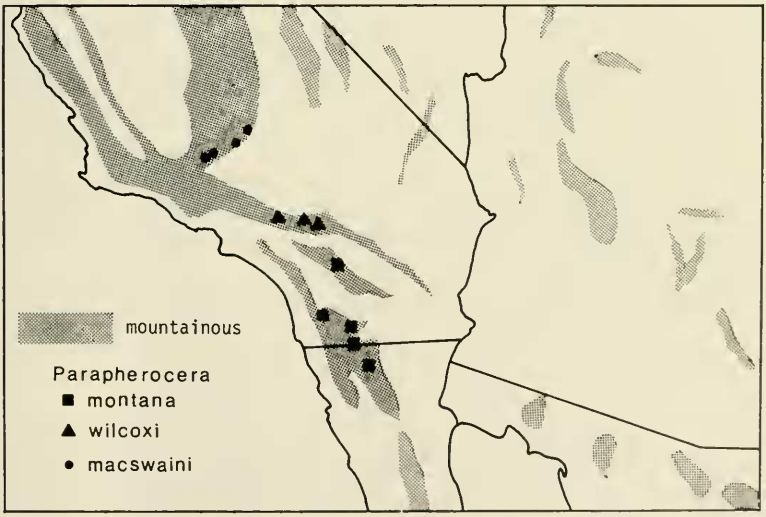

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Figs. 33–34. Distribution maps of southwestern United States and northeastern Mexico, including portions of the states of California, Nevada, Arizona, Sonora, and Baja California Norte. 33, distribution of *Schlingeria ammobata*. 34, distribution of *Parapherocera*.

Specimens Examined.—Holotype, ♀, 2855, CAS type no. 10481; 10 km north of Glamis, Algadones Sand Dunes, Imperial County, California; 100 m above sea level; MEI, March 17, 1969. Paratypes, 59♂♂, 44♀♀ and 1 of unknown sex (pupa only) from the following localities:

CALIFORNIA.—Los Angeles County: Lancaster, 6 km E, 68/04/30, JCH, ♂ *239* (UCR). San Bernardino County: Kramer Hills, 53/05/01, PDH, ♀ *278* (CIS); EIS, *279* (UCR); *280*; 59/04/19, EIS, ♂ *241* (MEI); ♀ *249*. Cronise Valley, 65/02/14, MEI, RCD, ♂ *234* LP (UCR). Kelso, 4 km S, 65/02/13, MEI, RCD, ♀ *277* P (UCR); 17 km SSW, 670 m, 69/05/08, MEI, PAR, ♂ *2863* (UCR); *2864*; *2865*; *2866*; *2867*; *2868*; *2869*; *2870*; *2871*; ♀ *2872* (UA); *2973* (INIA); *2874* (UCR); *2875*. Riverside County: Blythe, 28 km W, 120 m, 65/02/20, MEI, EIS, ♂ *222* LP (WSU); *223* LP (ASU); *224* LP (USU); *225* LP (UCR); *226* LP (CMNH); *227* LP (UK); *228* LP (USU); *229* P (AMNH); *230* P (UCR); ♀ *251* P (SMN); *252* P (USSR); *253* P (RNHL); *254* P (UCR); *255* P (VNM); *256* P (DZSA); *257* P (NMP); *258* P (KUF); *259* P (CSIR); *260* P (BNH); *261* P (DZSA); *262* P (WSU); *263* P (UCR); *264* LP (ASU); *265* LP (UCR); *266* LP (OSU); *267* LP (USU); *268* LP (CMNH); *269* LP (UK); *270* LP (AMNH); *271* P (ANSP); *272* LP (CMP); *274* P (CU); *275* LP (UCR); ? pupa only, *273* (MEI). North Palm Springs, 4.7 km N, 68/02/25, MEI, ♂ *236* (UCR). Cabazon, 8 km E, 65/02/19, MEI, EIS, ♂ *240* LP (UCR); ♀ *281* LP (UCR); 68/02/22, MEI, ♂ *238* P (UCR). Imperial County: Glamis, 12.5 km N, 100 m, 65/02/20, MEI, EIS, ♂ *231* P (UCR); *232*; ♀ *276* (USNM); 9.7 km N, 100 m, 68/02/02, MEI, PAR, ♂ *194* (MEI); *195* (CAS); *196*; *197* (CIS); *198* (UCR); *199*; *200* (CNC); *201* (UCD); *202* (UA); *203* (UZM); *204* (INIA); *205* (BMNH); *206* (INHS); *207* (SMN); *208* (USNM); *209* (USSR); *210* (RNHL); *211* (VNM); *212* (DZSA); *213* (NMP); *214* (KUF); *215* (CSIR); *216* (BNH); *217* (DSIR); *218* (ANSP); *219* (CMP); *220* (CU); *221* (MEI); *2857*; ♀ *242* (INHS); *243* (BMNH); *244* (CIS); *245* (UZM); *246* (UCR); *247* (UCD); *248* (CNC); *2855* (CAS) [HOLOTYPE]; 1.5 km W, 105 m, EIS, ♂ *233* (UCR); MEI, *237* (MEI); ♀ *282* (MEI); MEI, EIS, ♀ *250* P (MEI); 21 km W, 100 m, 69/03/17, MEI, ♂ *2858* (UCR).

MEXICO.—Sonora: Sonora, 83 km S, 48/04/21, ALM, ♂ *235* (USNM).

Behavior and Observations.—Rearing. Nearly 200 specimens of *Schlingeria ammobata* were reared from the egg stage to last-instar larvae between 1963 and 1966. Although they were reared on larvae of *Tribolium confusum* (J. duVal) in sand and most were given no free water, they remained alive and in an apparent healthy state for nearly two years. They never pupated even though alternate diets, free water, and temperature fluctuations were added to induce pupation. Day length variations were not tried, however, and this should clearly be done in the future to see if diapause can be broken.

Pupal Duration: Pupal duration within the laboratory at about 22°C lasted from 7 to 13 days (mean of 5, 10.8 days) for males, and from 8–14 days (mean of 15, 10.6 days) for females.

Predation: In the field, larvae of *Schlingeria ammobata* were occasionally attacked by myrmeliontid larvae and larvae of *Thereva semitaria* Coquillett. When kept in close proximity, larvae of *Schlingeria ammobata* became cannibalistic. In fact if several were confined in a small, sand-filled container, generally only a single specimen would survive. An adult specimen (*2857*) was collected being eaten by an asilid, *Efferia yuma* Wilcox (*2856*).

Flight: Flights were usually short in duration, low in altitude, and direct. Males of *S. ammobata*, when flying in a 30 to 35 km/hr wind, invariably flew into the wind at an angle of about 70° to the horizon. After attaining an elevation of about one meter, they would drift laterally and drop to the sand substrate, alighting two to three meters down wind from their original take off points.

Under windy conditions, females tended to rest in sheltered areas nearer and often under vegetation. Their flight was lower, more direct and averaged a greater ground distance than males.

Wind Adaptations: In a moderate to high velocity wind (above 25 km/hr) specimens tended to press their bodies as closely to the substrate as possible, and maneuver themselves into small dune ripples.

Oviposition: Female *S. ammobata* lay an average of 50 eggs. Below is a description of the oviposition behavior; the sequencing is after Irwin (1976).

Approach. The female walked forward on her hind two pairs of legs, the tip of her abdomen lightly touching the substrate and the forelegs waving in front just above the surface.

Stance. The head was held rather high and the abdomen held low. Her hind legs were stretched far behind the tip of her abdomen but to one side or the other.

Insertion. A pit was dug with the hind legs. As the hind leg pushed posteriorly from the thorax, some sand was shoved behind her abdomen. The hind legs were alternately pushed-pulled, each push shoving sand backwards, each pull lifting the legs above the substrate. The tip of the abdomen always remained in contact with the bottom of the pit. The pit when completed was about 4.5 mm deep. The abdomen, upon completion of the pit, was thrust deep into the bottom of the pit; only the first abdominal segment remained visible above the surface of the pit bottom. Following this, a half-second rest ensued.

Egg-laying.	A quick contraction of abdominal muscles presumably caused an egg to be laid.
Withdrawal.	As the abdomen withdrew, her hind legs were alternately pulled forward, dragging sand into the pit. This continued until the pit was completely filled in.
Rest.	A very short rest followed, after which the fly moved about 3 cm forward and repeated the sequence.
Timing.	The entire sequence lasted approximately 30 seconds, but as the number of sequences increased, the length of each sequence also increased.

Parapherocera Irwin, new genus
(Figs. 2, 8–10, 13–18, 20, 22, 24–26, 30–32, 34, 42–48)

Derivation of Name.—*Para* = closely related to; *Pherocera* = a genus of therevids described by Cole (1923a). *Gender*: Feminine. *Type-species*: *Parapherocera montana* Irwin, new genus, new species, by present designation. *Included species*: *P. montana* Irwin, *P. macswaini* Irwin, and *P. wilcoxi* Irwin.

Diagnosis.—Hypognathus; compound eyes of male separated by at least width of ocellar tubercle (Fig. 17), all facets same size; mouthparts large; protuberance on face below antennae extending anteriorly beyond frons (Fig. 18); antennal style 3-segmented, last of which is a terminal bristle (Figs. 13, 24, 25, 26); very little tomentum on head; prosternum bare; anterior surface of coxa 1 with many thin elongate setae; ratio bt_1/bt_3 about 1.00; femora lacking setae; wing vein r_1 setose (Fig. 9); wing cell M_3 closed; tergum (9+)10 of female terminalia with a few, reduced, spinelike setae (Fig. 22); male terminalia lacking hypandrium; dorsal gonocoxal processes strongly connected by dorsal gonocoxal bridge; paraproct strongly united with dorsal apodeme of aedeagus and dorsal gonocoxal bridge (Fig. 47); ventral apodeme with forked appendage (Figs. 30, 31, 32).

Description.—Medium to thin bodied flies (Fig. 2); length excluding antennae, 4.2–4.9 mm; males and females of similar size.

Head: Hypognathus; male dichoptic, the frons very wide at its narrowest point (Fig. 17), always much wider than 2× the width of the anterior ocellus; frons of female at level of anterior ocellus about 2× as wide as ocellar tubercle (Fig. 16); frons of female slightly wider than that of male; head about ¾ as high as wide; distance between compound eyes at lower corners of eyes slightly less than head height; compound eyes of both sexes small, of uniform facet size (Figs. 16, 17, 18); antennal insertion about midway between ventral portion of genae and vertex; frons at antennal insertion about equal to ½ of head width; proboscis elongate,

clearly visible; palps 1-segmented, long, heavy (Figs. 10, 18), and covered with thick hairs; antennae as long or longer than head depth (except for female *P. macswaini* which have antennae slightly shorter than head depth); antennal style 3-segmented, last of which is a terminal bristle (Figs. 13, 24, 25, 26); frons of both sexes mostly shining with a few patches of tomentum along compound eye margins; face below antennae protruding anteriorly farther than frons above antennae (Fig. 18); ocellar and postocellar hairs long, sparse; occipital setae short, inconspicuous, present.

Thorax: Mesonotum about 80–90% as wide as long (excluding length of scutellum); mesonotal setal pattern: *np* usually 3 (from 2–4), *sa* always 1 (one specimen with 2 on one side), *pa* always 1, *dc* from 0 to 1, *sc* always 1; prosternum without pile; anepisternum, pleurotergite and pteropleurite without tomentum; rest of pleural region and coxae with silver tomentum.

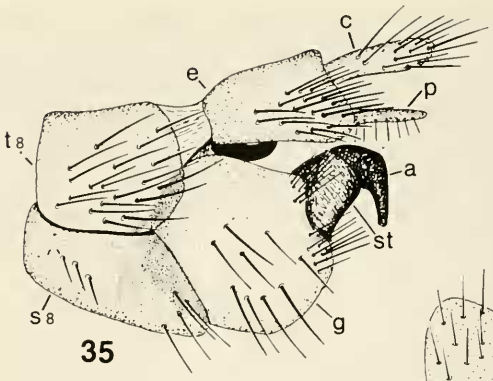
Wing: Vein r_1 setose (Fig. 9); cell M_3 closed; veins r_4 and r_5 about equal in length; distance from outrun of r_4 to outrun r_5 30–50% as long as r_5 (usually 33–45%) (Fig. 8).

Legs: Coxa 1 with many (40 or more) long setae over entire anterior surface; posterior surfaces of coxae 1 and 2 very sparsely tomentose, not pilose; femora without setae; tibia 1 lacking setae or with at most a single seta in the *ad* position, with 0–2 in the *av* position, 0–3 in the *pd* position and 0–5 in the *pv* position; tibia 2 with 1–4 in *ad* position, 0–2 in *ad* position, 1–4 in *pd* position, and 1–3 in *pv* position; tibia 3 with 3–6, usually 4, in *ad* position, 3–7 in *av* position, 0–6 in *pd* position, and 0–2, usually 0, in *pv* position; bt_1 and bt_3 about equal in length: tibia 1 swollen, thicker than tibia 3.

Abdomen: Abdomen of both sexes cylindrical, tapered posteriorly (Fig. 2).

Female Terminalia: Vaginal apodeme (*fur*, Fig. 22) very thick, the anterior portion closed and posterior portion open, horseshoe-shaped; 3 unsclerotized spermathecae (*sp*, Fig. 22); subanal plate (*su*, Fig. 22) with sparse, thin setae; tergum (9+)10 with a few reduced, spinelike setae (*t*(9+)10, Fig. 22); penial guide anteriorly fused with thickened bowlike flaps attached to sternum 8 (*pg*, *s*8, Fig. 22).

Male Terminalia: Sternum 8 (*s*8, Figs. 42, 43) squarish; tergum 8 (*t*8, Figs. 42, 44) somewhat bilobate, with thickened, elongate setae on posterolateral margins; epandrium about as long as wide measured medially longitudinally and latitudinally (*e*, Figs. 42, 45, 46), the posterior ¾ covered with setae; cercus slightly bilobate, both halves solidly joined to one another and extending posteriorly slightly beyond paraproct (*c*, Figs. 42, 45, 46); paraproct elongate shield-shaped, its base firmly attached to dorsal apodeme of aedeagus, dorsal gonocoxal process, and dorsal gonocoxal bridge, with



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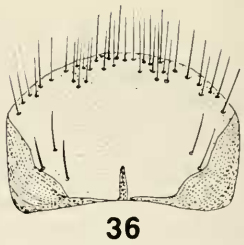

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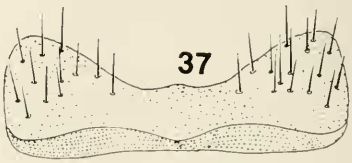

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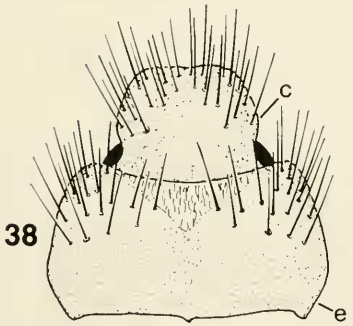

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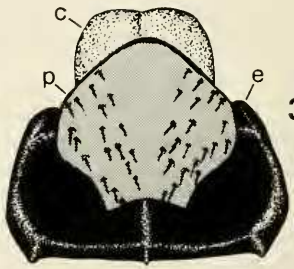

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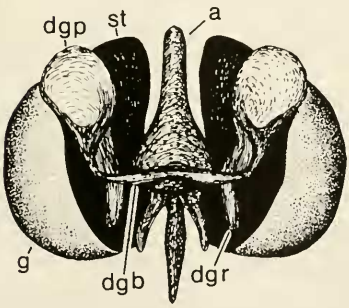

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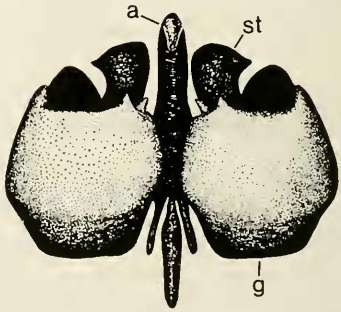

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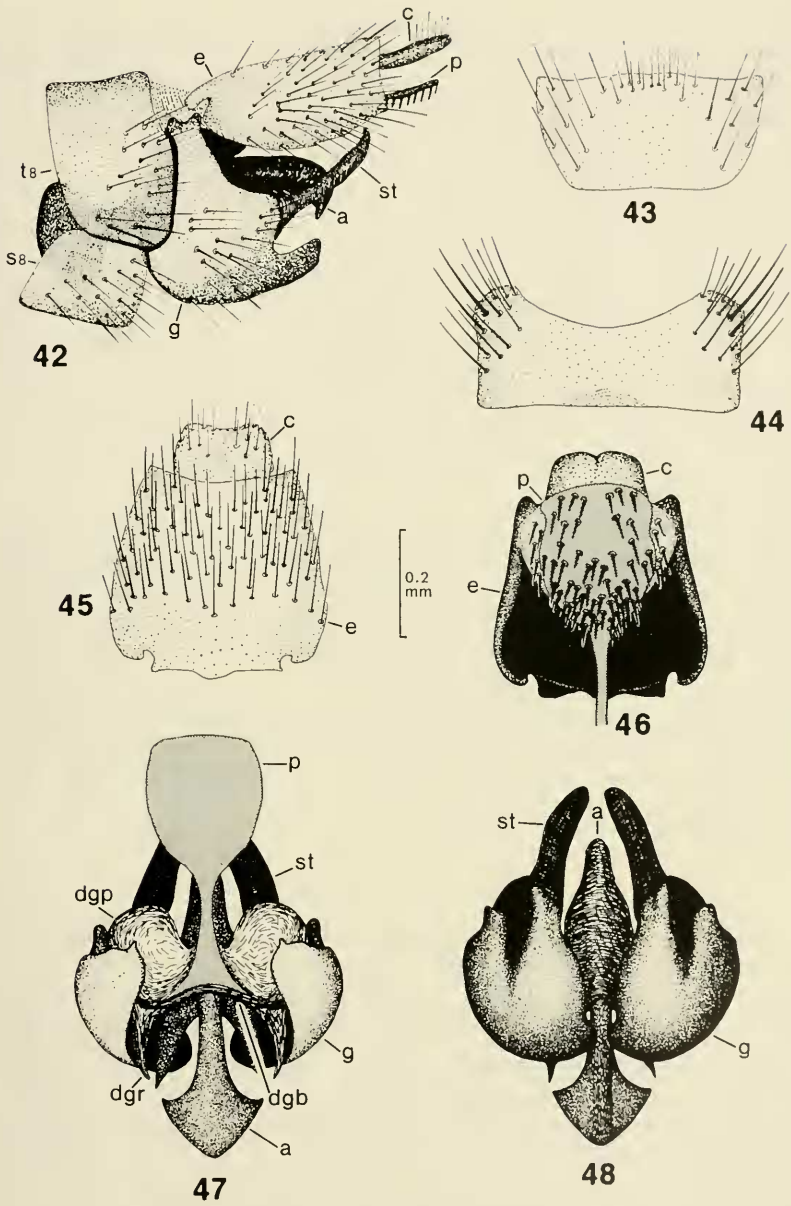
Figs. 35–41. Male terminalia of *Schlingeria ammobata*. 35, lateral view (*226*). 36, sternum 8 (*241*), ventral view. 37, tergum 8 (*241*), dorsal view. 38, epandrium and cercus (*241*), dorsal view. 39, epandrium, cercus and paraproct (*241*), ventral view. 40, gonocoxite and aedeagus (*241*), dorsal view. 41, gonocoxite and aedeagus (*241*), ventral view. a = aedeagus; c = cercus; dgb = dorsal gonocoxal bridge; dgp = dorsal gonocoxal process; dgr = dorsal gonocoxal rod; e = epandrium; g = gonocoxite; p = paraproct; s8 = sternum 8; st = stylus; t8 = tergum 8.



Figs. 42–48. Male terminalia of *Parapherocera montana* (*4047*). 42, lateral view. 43, sternum 8, ventral view. 44, tergum 8, dorsal view. 45, epandrium and cercus, dorsal view. 46, epandrium, cercus and distal portion of paraproct, ventral view. 47, gonocoxite and aedeagus, dorsal view. 48, gonocoxite and aedeagus, ventral view. a = aedeagus; c = cercus; dgb = dorsal gonocoxal bridge; dgp = dorsal gonocoxal process; dgr = dorsal gonocoxal rod; e = epandrium; g = gonocoxite; p = paraproct; s8 = sternum 8; st = stylus; t8 = tergum 8.

elongate, thickened setae becoming dense basally (*p*, Figs. 42, 46, 47); gonocoxites with 2 posteroventral projections (*g*, Fig. 48); gonocoxite not joined together ventrally (Fig. 48); hypandrium completely lacking; dorsal gonocoxal process (*dgp*) enlarged, bulbous and strongly connected to basal portion of paraproct (Fig. 47) and to dorsal gonocoxal bridge (*dgb*); dorsal gonocoxal bridge strong, uniting 2 gonocoxites (Fig. 47); dorsal gonocoxal rod (*dgr*) jutting anteriorly and exceeding gonocoxal shell (Fig. 47); stylus (*st*) elongate, projecting posteriorly beyond phallus (*ph*) (Figs. 42, 47, 48); aedeagus rather large, complex (Figs. 30, 31, 32); ventral apodeme (*va*) short, broad with an extra forked process attached to its apex (not identified, Figs. 30, 31, 32); dorsal apodeme (*da*) long, broad, apically sharply curved dorsad (where it attaches to basal end of paraproct); ejaculatory apodeme (*ea*) very large, extending well into abdomen (Fig. 42), rather triangular anteriorly and wedgeshaped (Figs. 30, 31, 32); phallus (*ph*) thin and deep with a very short, curved apical section (Figs. 30, 31).

Phylogenetic Placement: *Parapherocera* clearly has a sister-group relationship with *Pherocera* and can be characterized by the following apomorphic character states: Ventral apodeme of aedeagus with extra forked structure; ejaculatory apodeme of aedeagus very enlarged; stylus of aedeagus elongate, sickle-shaped; palps enlarged; tergum (9+)10 with only a few reduced setae; hypandrium lacking.

The species within the genus *Parapherocera* are very closely related to one another, but it appears as though *P. montana* has a sister-group relation to both *P. macswaini* and *P. wilcoxi*, and the latter two have a sister-group relationship with each other.

Key to the Species of *Parapherocera* Irwin

1. Abdominal segments 1–2 (sometimes 3) orange *montana* Irwin
– Entire abdomen brown to black 2
2. Penultimate segment of antennal style very large (Fig. 26) (greater than 0.1 mm); female tibia 1 without setae in *av* position; ground color light brown, chocolate colored *macswaini* Irwin
– Penultimate segment of antennal style small (Fig. 25) (less than 0.1 mm); female tibia 1 with 1–2 setae in *av* position; ground color dark brown to black *wilcoxi* Irwin

Parapherocera montana Irwin, new species

Derivation of Name.—*montana* (Latin) = montane, pertaining to mountains.

Description.—Female holotype (Fig. 2), see number *1116* in Table 2 for

Table 2. Measurements in mm.

Species	*Parapherocera montana* Irwin									
Type	PARA	PARA	PARA	PARA	PARA	HOLO	PARA	PARA	PARA	PARA
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
No.	*1135*	*1140*	*1153*	*1143*	*1132*	*1116*	*1114*	*1121*	*1120*	*1144*
Total length, excluding antennae	5.0	4.7	4.8	5.4	4.6	5.5	5.9	5.0	5.7	4.4
Head width	1.32	1.30	1.24	1.44	1.26	1.38	1.36	1.22	1.44	1.16
Head height	.96	.96	.96	1.10	.94	1.00	1.08	.92	1.08	.90
Head depth	.80	.72	.66	.70	.68	.70	.76	.70	.84	.70
Distance between eyes at vertex	.30	.26	.28	.30	.26	.34	.38	.32	.40	.30
Frontal width at anterior ocellus	.28	.22	.26	.30	.26	.36	.38	.36	.42	.32
Frontal width at antennae	.60	.56	.60	.68	.56	.70	.70	.60	.72	.60
Facial width at lower edge of eye	.90	.84	.74	.90	.82	.90	1.20	.94	1.00	.84
Eye height	.70	.74	.70	.84	.70	.76	.74	.68	.80	.64
Eye depth	.60	.54	.50	.58	.52	.52	.52	.50	.60	.48
Frontal protuberance depth	.14	.14	.12	.16	.14	.14	.14	.14	.16	.14
Antennal segment I length	.30	.28	.30	.34	.30	.30	.32	.28	.32	.28
Antennal segment III length	.40	.44	.44	.48	.40	.44	.44	.42	.44	.40
Mesonotal length (excluding scutellum)	1.28	1.20	1.20	1.36	1.18	1.32	1.40	1.20	1.38	1.14
Mesonotal width	1.12	1.04	1.08	1.22	1.00	1.12	1.26	1.04	1.24	.90
Wing length (humeral crossvein to apex)	3.00	3.14	3.12	3.44	2.90	3.22	3.48	3.02	3.42	2.70
Wing width (maximum)	1.22	1.24	1.24	1.34	1.24	1.24	1.34	1.22	1.36	1.04
Distance fork r_{4+5} to outrun r_4	.80	.92	.88	1.04	.98	.86	1.00	.76	1.10	.78
Distance fork r_{4+5} to outrun r_5	.80	.92	.88	1.00	.92	.86	.98	.76	1.00	.74
Distance outruns r_4 to r_5	.34	.36	.36	.38	.28	.36	.40	.38	.44	.26
Coxa 1 length	.80	.80	.80	.88	.78	.84	.90	.80	.84	.76
Tibia 1 length	1.16	1.16	1.08	1.24	1.12	1.16	1.36	1.14	1.30	1.08
Tibia 3 length	1.62	1.76	1.64	1.80	1.70	1.76	1.96	1.60	1.92	1.50
Basitarsus 1 length	.60	.64	.60	.66	.58	.66	.66	.60	.72	.58
Basitarsus 3 length	.64	.68	.62	.66	.60	.66	.72	.60	.72	.60

linear measurements. Ground color black with portion of abdomen orange; pile short, moderately dense, mostly black; tomentum sparse, silvery, covering small portion of body.

Head: Pile on frons moderately dense, long, black; upper face bare; genae with moderately dense, black pile; ventral occipital pile long, dense, white; dorsal occipital setae very short, about 7 pairs confined to areas laterad of ocellar tubercle; ocellar and postocellar hairs long, black, 3 pairs. Tomentum densely silver, confined to 6 small patches all adjacent to compound eyes: 2 laterad and slightly ventrad of anterior ocellus, 2 laterad of antennal insertions, and 2 at interface of genae and face (Fig. 16); silvery tomentum along hind margin of compound eye at lateral margin of occiput. Minimal distance between compound eyes located at posterior ocelli. Compound eyes of moderate size. Genal width 0.26 mm. Antennal segments dark brown, I with elongate black hairs mostly ventrad, II with shorter black hairs, III with elongate tomentum (Fig. 13). Antennae 1.2× as long as head depth. Segment I about 3× as long as wide; segment II as long as wide; segment III about 3½× as long as wide, elongate tapered. Segments I/II/III, 6/2/9. Style 3-segmented, last of which is a terminal bristle (Fig. 24). Palps and proboscis conspicuous, reaching beyond oral cavity; dark brown with black hairs.

Thorax: Mesonotum with a pair of sparsely tomentose silvery vittae fading posteriorly, surrounded by sparsely tomentose black and non-tomentose areas. Scutellum with sparse, erect, black pile; mesonotum with shorter semi-appressed black pile anteriorly, becoming larger and more erect posteriorly. A pair of lines of the mesonotum contain hairs that are slightly larger than the normal hairs but no thicker; these occupy the dorsocentral setal zone. Mesonotal setal pattern: *np* = 3, *sa* = 1, *pa* = 1, *dc* = 0, *sc* = 1. All setae black. Prosternum lacking pile; anepisternum, sternopleurite and pleurotergite with sparse, thin, white pile.

Wing (Figs. 8, 9): Veins brown to dark brown, hyaline between. $Medial_3$ joining m_4 0.22 mm before wing margin. Haltere brown with yellow-brown knob; stem 0.36 mm long; knob 0.32 mm long. Vein r_4 about as long as r_5; distance between outruns of r_4 and r_5 42% as long as length of r_4.

Legs: Dark brown with orangish light brown on apical ⅕ of femora 1 and 2, dorsal side of tibia 2, and whitish on dorsal and outer lateral sides of tibia 1. Bt_1 about the same size as bt_3. Setae black; tibial setal pattern: t_1 [*ad* = 0, *pd* = 1, *pv* = 3], t_2 [*ad* = 4, *av* = 1, *pd* = 1, *pv* = 2], t_3 [*ad* = 5, *av* = 3, *pd* = 2, *pv* = 0].

Abdomen: Ground color of segments 1–3 yellowish orange; rest of abdomen black or very dark brown. Pile sparse, short, black on terga 1–3; longer, yellow brown on anterior lateral surfaces of tergum 1; very short, brown on segments 4–8. Tomentum very sparse.

Terminalia (Figs. 20, 22): As depicted under generic description.

Female Variation.—See Table 2, numbers *1114*, *1120*, *1121*, *1144* for linear measurements. Females very similar except as follows: Size varies from 4.4 mm (*1144*) to 6.4 mm (*1131*), excluding antennae. Antennal segments I/II/III with ratio of 14/6/23 to 18/6/27. Tomentose areas on frons and face vary; specimen *1131* with most of tomentum rubbed off; most specimens without obvious tomentum on upper frons. Mesonotal setal pattern fairly consistent; specimen *1144* with *np* 2 on one side, 3 on other; specimen *1120* with *sa* 1 on one side, 2 on other. Length of coalesced wing vein m_{3+4} from 0.06 to 0.22 mm. Ratio bt_1/bt_3 from 0.91 to 1.00. Tibial setae vary as follows: t_1 [*ad* 0–1, *pd* 0–1, *pv* 2–4], t_2 [*ad* 2–4, *av* 1–2, *pd* 1–3, *pv* 1–2], t_3 [*ad* 4–5, *av* 3–5, *pd* 1–5, *pv* 0–2].

Male Description and Variation.—See Table 2, numbers *1132*, *1135*, *1140*, *1143*, *1153* for linear measurements. Males similar to females except as follows: Males dichoptic but minimal distance between compound eyes on frons not as great (0.22 to 0.30 mm for males compared to 0.30 to 0.40 for females) (compare Fig. 17 with 16). Antennal segment I 64–75% as long as segment III. Pile longer on males. Legs entirely brown. Mesonotal setae very similar except 2 specimens had only 2 *np* setae (*1132*, *1135*). Coalesced vein m_{3+4} from 0.12 to 0.18 mm long. Tibial setal pattern: t_1 [*ad* 0, *av* 0, *pd* 1–3, *pv* 2–5], t_2 [*ad* 2–3, *av* 0–2, *pd* 2–4, *pv* 3–5], t_3 [*ad* 4–5, *av* 3–5, *pd* 0–4, *pv* 0–2]. Abdominal orange coloration mostly confined to terga 1 and 2.

Male Terminalia (Figs. 30–32, 42–48): Sternum 8 with setae along lateral margins and with shorter group of setae along medial posterior margin (*s8*, Figs. 42, 43). Tergum 8 with strong setae along posterolateral margins (*t8*, Figs. 42, 44). Epandrium with setae covering most of dorsal surface (*e*, Figs. 42, 45). Cercus slightly bilobate, its dorsal surface with sparse, thin setae (*c*, Figs. 42, 45, 46). Gonocoxite with a few setae on lateral surface (*g*, Fig. 44).

Distribution and Ecological Placement.—Parapherocera montana occurs throughout the mountainous regions of southern California and northern Baja California, south of the transverse ranges of the San Gabriel and San Bernadino Mountains. The species has been collected in the San Jacinto-Santa Rosa Mountain Range in Riverside County, the Laguna Mountains in San Diego County, California, and in the Sierara Juarez Range of Baja California, Mexico (Fig. 34). Specimens have been collected from 900–1,500 meters above sea level. *Parapherocera montana* has usually been collected in sandy washes in pine-sagebrush woodland. One specimen was collected in a malaise trap.

Specimens Examined.—Holotype, ♀, *1116*, CAS type no. 10450; about 6 km south of La Rumorosa, Baja California Norte, Mexico; 1,321 m altitude; MEI; April 18, 1964; sandy creek bottom. Paratypes, 19♂♂, 26♀♀ from the following localities:

CALIFORNIA.—Riverside County: Santa Rosa Mts, 1¼ km N Jct. Deep

Creek and Horsethief Creek, 73/04/18–25, AT, ♀ *323918* Univ. Calif. Insect Survey (UCR). San Diego County: Oak Grove, 64/04/13, JW, ♂ *1155* (UCR). Buckman Springs, near, 53/05/07, FXW, ♀ *1150* (MEI); ♂ *1151* (CAS); *1152* (CIS); *1153* (MEI); *1154* (CIS). Anza State Park, Culp Canyon, 59/04/04, EIS, ♂ *1140* (UA); *1141* (INIA); *1142* (UCD); *1143* (MEI); ♀ *1144* (MEI); *1145* (UCR); *1146* (INIA); *1147* (UCR); JCH, ♀ *1148* (CAS); *1149* (UCR).

MEXICO.—Baja California Norte: La Rumorosa, 6 km S, 1,321 m, MEI, ♀ *1113* (USNM); *1114* (CNC); *1115* (UCR); *1116* (CAS) [HOLOTYPE]; *1117* (UZM); *1118* (CIS); *1119* (BMNH); *1120* (INHS); *1121* (UA); *1122* (MEI); *4044* (MEI); ♂ *1132* (MEI); *1133* (CAS); *1134* (USNM); *1135* (CNC); EIS, ♀ *1123* (UCD); *1124* (UCR); *1126* (UCR); *1127* (MEI); ♂ *1125* (UCR); *1136* (UCR); *1137* (UZM); *1138* (INHS); *4047* (MEI); 16 km S, 1,402 m, EIS, ♀ *1128* (MEI); MEI, ♀ *1129* (UCR); *1130* (UCR); ♂ *1139* (BMNH).

Parapherocera wilcoxi Irwin, new species

Derivation of Name.—Named in honor of Mr. Joe Wilcox, University of California, Riverside.

Description.—Female, holotype, see number *1180* in Table 3 for linear measurements. Ground color dark brown; pile short, moderately dense, mostly black; tomentum sparse, silvery, covering only small portion of body. This species very similar to *P. montana* with the following differences:

Head (Fig. 14): Pile on genae relatively sparse, black; pile on ventral portion of occiput long, tan, denser. Dorsal occipital setae similar to those of *P. macswaini* but not elongate, extending somewhat further along margin of occiput. Several pairs of thin, elongate, black ocellar and postocellar hairs. Genal width 0.26 mm. Antennal segments dark brown, head depth about 86% of antennal length. Segments I/II/III, about 3/1/5. Penultimate segment of antennal style small (Fig. 25).

Thorax: Scutellum with sparse, thin pile. Mesontal setal pattern: *np* = 3, *sa* = 1, *pa* = 1, *dc* = 0, *sc* = 1.

Wing: Veins medium brown, hyaline between. $Medial_3$ joining m_4 0.12 mm before wing margin. Haltere stem and knob medium brown; stem 0.28 mm long; knob 0.24 mm long. Vein r_4 about the same length as vein r_5. Distance between outruns of r_4 and r_5 42% as long as length of r_4.

Legs: Ground color dark brown. Yellowish brown on distal ⅕ of femur 1, distal ½ of femur 2, and distal ⅕ of femur 3. Tibiae 1 and 2 yellowish basally fading to brown apically. Tibia 1 basal ⅔ whitish cream, apical ⅓ brown; tarsi brown. Bt_1 about as long as bt_3. Tibial setal pattern: t_1 [*ad* = 0, *av* = 1, *pd* = 0, *pv* = 0], t_2 [*ad* = 1, *av* = 2, *pd* = 1, *pv* = 3], t_3 [*ad* = 4, *av* = 5, *pd* = 3, *pv* = 0].

Table 3. Measurements in mm.

Species	*Parapherocera wilcoxi* Irwin								
Type	PARA	PARA	PARA	PARA	PARA	HOLO	PARA	PARA	PARA
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀
No.	*1163*	*1165*	*1169*	*4046*	*4045*	*1180*	*1175*	*1177*	*1169*
Total length, excluding antennae	4.8	4.8	4.2	5.2	4.5	5.6	5.7	5.4	4.2
Head width	1.32	1.20	1.10	1.40	1.28	1.36	1.40	1.30	1.08
Head height	.96	.94	.86	1.04	.96	1.00	1.04	1.02	.80
Head depth	.68	.76	.64	.72	.70	.74	.68	.70	.58
Distance between eyes at vertex	.26	.26	.28	.32	.26	.32	.30	.50	.30
Frontal width at anterior ocellus	.24	.24	.28	.24	.20	.20	.36	.36	.30
Frontal width at antennae	.66	.60	.56	.64	.58	.64	.66	.70	.60
Facial width at lower edge of eye	.90	.82	.80	.92	.94	.96	1.00	.94	.78
Eye height	.72	.70	.58	.80	.74	.74	.74	.72	.56
Eye depth	.48	.60	.48	.60	.60	.58	.46	.46	.44
Frontal protuberance depth	.10	.14	.14	.12	.12	.14	.14	.14	.12
Antennal segment I length	.28	.26	.26	.30	.24	.28	.28	.32	.26
Antennal segment III length	.44	.44	.38	.44	.38	.48	.46	.46	.38
Mesonotal length (exeluding scutellum)	1.24	1.16	.98	1.30	1.10	1.28	1.30	1.30	1.00
Mesonotal width	1.14	1.00	.88	1.08	1.00	1.16	1.16	1.16	.90
Wing length (humeral crossvein to apex)	3.16	3.00	2.64	3.22	2.94	3.26	3.40	3.10	2.60
Wing width (maximum)	1.36	1.24	1.06	1.28	1.16	1.34	1.42	1.30	1.00
Distance fork r_{4+5} to outrun r_4	.86	.88	.72	.92	.82	.86	1.00	.84	.72
Distance fork r_{4+5} to outrun r_5	.84	.88	.72	.92	.84	.86	.98	.84	.70
Distance outruns r_4 to r_5	.34	.32	.26	.32	.28	.36	.36	.34	.26
Coxa 1 length	.74	.76	.68	.84	.74	.84	.84	.88	.66
Tibia 1 length	1.22	1.12	1.02	1.24	1.06	1.30	1.28	1.24	1.04
Tibia 3 length	1.76	1.66	1.48	1.78	1.56	1.84	1.84	1.82	1.50
Basitarsus 1 length	.68	.60	.60	.70	.58	.64	.68	.68	.58
Basitarsus 3 length	.68	.62	.64	.70	.58	.64	.70	.68	.60

Abdomen: Ground color medium brown overall. Pile short, sparse, brown to light brown over entire abdomen.

Female Variation.—See Table 3, number *1180*, *1175*, *1177*, *1169* for linear measurements. Length 4.1 mm (*1170*) to 5.7 mm (*1175*), excluding antennae. Ratio antennal segments I/II/III from 13/6/26 (*1175*) to 15/6/23 (*1172*). Mesonotal setal pattern fairly constant; specimens *1175* and *1177* had 1 pair of *dc* setae. Length of coalesced wing vein m_{3+4} from 0.10 to 0.22 mm. Ratio bt_1/bt_3 from 0.97 to 1.00. Tibial setae vary as follows: t_1 [*av* 1–2], t_2 [*ad* 1–2, *av* 1–2, *pd* 1–2, *pv* 1–3, t_3 [*av* 4–5, *pd* 3–5].

Male Description and Variation.—See Table 3, numbers *1163*, *1165*, *1169*, *4046*, *4045* for linear measurements. Length 4.1 mm (*1158*) to 5.2 mm (*4046*), excluding antennae. Males similar to males of *P. montana* and *macswaini* except as follows: Eyes of male closer together than in other 2 species, especially toward vertex; minimal distance between compound eyes 0.20 to 0.28 mm. Antennal segment I 60–70% as long as segment III. Legs very dark brown except for some yellowish brown on distal ⅕ of femur 2 and basal ¼ of tibia 2 in specimens *1157*, *1166*, *1162*, *1158*. Ratio bt_1/bt_3 from 0.93 to 1.00. Mesonotal setal pattern very consistent, specimen *4045* with one side having *np* = 3, other side 4; specimens *1165* and *4045* with 1 pair of *dc* setae. Coalesced vein m_{3+4} from 0.08 to 0.14 mm long. Tibial setal pattern: t_1 [*ad* 0, *av* 0, *pd* 0–1, *pv* 1–3], t_2 [*ad* 2–4, *av* 1–2, *pd* 1–4, *pv* 2–3], t_3 [*ad* 3–5, *av* 4–7, *pd* 3–5, *pv* 0–1]. Abdomen brown, male terminalia very similar to *P. montana*.

Distribution and Ecological Placement.—*Parapherocera wilcoxi* occupies the transverse mountain ranges of southern California and has been collected from the San Bernardino Mountains from elevations of 2,000–2,300 meters above sea level (Fig. 34).

Specimens Examined.—Holotype, ♀ *1180*, CAS type no. 10451; Big Bear Lake, San Bernardino Co., California, JW, May 25, 1965. Paratypes, 15♂♂, 11♀♀ from the following localities:

CALIFORNIA.—San Bernardino County: Big Bear Lake, 65/05/25, JW, ♀ *1180* (CAS) [HOLOTYPE]. Camp Baldy, 2,000 m, 65/06/26, RCB, ♂ *1156* (CAS); *1157* (MEI); *1158* (UCD); *1159* (CIS); *1160* (UZM); ♀ *1177* (INHS); *1178* (MEI); *1179* (MEI); RMB, ♂ *1161* (UCR); *1162* (USNM); *1163* (CNC); *1164* (BMNH); *1165* (INHS); *1166* (MEI); *1167* (MEI); *1168* (MEI); ♀ *1169* (MEI); *1170* (UCD); *1171* (CIS); *1172* (UZM); *1173* (UCR); *1174* (USNM); *1175* (CNC); *1176* (BMNH). Sugarloaf Mountain, 2,330 m, 72/05/07, GRB, ♂ *4045* (UCR); *4046* (UCR).

Parapherocera macswaini Irwin, new species

Derivation of Name.—Named in honor of the late Dr. John W. MacSwain, University of California, Berkeley.

Table 4. Measurements in mm.

Species	*Parapherocera macswaini* Irwin				
Type	PARA	PARA	PARA	HOLO	PARA
Sex	♂	♂	♂	♀	♀
No.	*1186*	*1182*	*1184*	*1188*	*1181*
Total length, excluding antennae	5.0	5.0	–	5.3	5.7
Head width	1.30	1.36	–	1.30	1.42
Head height	1.00	1.00	–	.96	1.08
Head depth	.70	.68	–	.78	.84
Distance between eyes at vertex	.34	.32	–	.34	.42
Frontal width at anterior ocellus	.32	.30	–	.38	.44
Frontal width at antennae	.64	.76	–	.68	.68
Facial width at lower edge of eye	.90	.88	–	.90	1.00
Eye height	.74	.78	–	.66	.80
Eye depth	.54	.56	–	.56	.62
Frontal protuberance depth	.12	.10	–	.16	.16
Antennal segment I length	.30	.24	–	.24	.24
Antennal segment III length	.40	.40	–	.40	.40
Mesonotal length (excluding scutellum)	1.20	1.20	1.20	1.20	1.26
Mesonotal width	1.08	1.04	1.00	1.04	1.16
Wing length (humeral crossvein to apex)	3.28	3.20	3.30	3.20	3.44
Wing width (maximum)	1.26	1.28	1.40	1.20	1.34
Distance fork r_{4+5} to outrun r_4	1.00	.88	1.04	.98	.90
Distance fork r_{4+5} to outrun r_5	.96	.84	1.02	.98	.94
Distance outruns r_4 to r_5	.32	.30	.36	.32	.40
Coxa 1 length	.84	.76	.78	.80	.84
Tibia 1 length	1.18	1.06	1.20	1.16	1.20
Tibia 3 length	1.70	1.56	1.80	1.72	1.76
Basitarsus 1 length	.66	.62	.66	.64	.64
Basitarsus 3 engtth	.70	.68	.66	.66	.64

Description.—Female, holotype, see number *1188* in Table 4 for linear measurements. Ground color chocolate brown; pile short, moderately dense, mostly black; tomentum, sparse, silvery, covering small portion of body. This species very similar to *P. montana* with the following differences:

Head (Fig. 15): Pile on genae relatively sparse, black; on ventral surface of genae (i.e. lower occiput), denser and tan; a few of the dorsal occipital setae fairly long (0.2 mm); several pairs of ocellar and postocellar hairs. Genal width 0.30 mm. Antennal segments medium brown. Head depth about equal to length of antennae. Segments I II III, 5/2 8. Penultimate segment of antennal style very large (Fig. 26).

Thorax: Scutellum with very sparse, thin pile, almost bare. The line of taller hairs on the mesonotum follows tomentose vittae. Mesonotal setal pattern with *np* = 3, *sa* = 1, *pa* = 1, *dc* = 1, *sc* = 1.

Wing: Veins light brown, hyaline between. $Medial_3$ joining m_4 0.14

mm before wing margin. Haltere stem and knob yellow brown, light colored; stem 0.30 mm long; knob 0.34 mm long. Vein r_4 about equal in length to r_5; distance between outruns of r_4 and r_5 about ½ as long as length of r_4.

Legs: Ground color medium brown basally to yellowish brown apically. Most of femur 1 medium brown, apical ⅓ yellowish; femur 2, apical ½ yellowish; femur 3, apical ⅓ yellowish. Tibia 1 with basal ⅔ whitish cream, apical ⅓ brown; other tibiae yellowish; tarsi brown. Bt_1 about as long as bt_3. Tibial setal pattern: t_1 [*ad* 0, *av* 0, *pd* 2, *pv* 2], t_2 [*ad* 2, *pv* 2, *pd* 3, *pv* 2], t_3 [*ad* 4, *av* 4, *pd* 4, *pv* 0].

Abdomen: Ground color chocolate brown overall. Pile sparse, short, black on terga 1–2, brown on segments 3–8, yellow brown on anterolateral margin of tergum 1. Tomentum sparse.

Female Variation.—See Table 4, numbers *1188*, *1181* for linear measurements. Size varies from 4.3 mm (*1187*) to 5.7 mm (*1181*), excluding antennae. Antennal segments ranging from 12/5/18 (*1187*) to 13/5/26 (*1181*). Mesonotal setal pattern fairly constant, but most specimens lack *dc* setae. Length of coalesced wing vein m_{3+4} from 0.12 to 0.14 mm. Ratio bt_1/bt_3 from 0.97 to 1.00. Tibial setae vary as follows: t_1 [*pv* 1–2], t_2 [*av* 1–2, *pd* 2–3, *pv* 1–2], t_3 [*ad* 4–5, *pv* 0–1].

Male Description and Variation.—See Table 4, numbers *1186*, *1182*, *1184* for linear measurements. Length 4.1 mm (*1185*) to 5.0 mm (*1183*), excluding antennae. Males similar to males of *P. montana* except as follows: Minimal distance between compound eyes 0.30–0.32 mm. Antennal segment I 60–70% as long as segment III. Legs brown, except specimen *1182* which has tibia 2 yellowish brown. Ratio bt_1/bt_3 from 0.91 to 1.00. Mesonotal setal pattern very consistent. Coalesced vein m_{3+4} from 0.14 to 0.18 mm long. Tibial setal pattern: t_1 [*ad* 0, *av* 0, *pd* 0–2, *pv* 2–3], t_2 [*ad* 1–3, *av* 1, *pd* 1–5, *pv* 1–2], t_3 [*ad* 3–6, *av* 4–5, *pd* 5–6, *pv* 0]. Abdomen entirely brown with male terminalia very similar to *P. montana*.

Distribution and Ecological Placement.—*Pherocera macswaini* occurs in the extreme southeastern portion of the Sierra Nevada Mountain Range of southern California (Fig. 34).

Specimens Examined.—Holotype, ♀, *1188*, CAS type no. 10449, Short Canyon, about 9 km west of Inyokern, Kern Co., California, JWM, April 11, 1954. Paratypes, 5♂♂, 4♀♀ from the following localities:

CALIFORNIA.—Kern County: Short Canyon, 9 km W Inyokern, 54/04/11, JWM, ♂ *1185* (CIS); *1186* (CAS); ♀ *1187* (CIS); *1188* (CAS) [HOLOTYPE]; 59/03/29, GIS, ♀ *1189* (UZM). Sand Canyon, 5 km W Brown, 66/04/07, RCS, ♀ *1190* (UCD); Walker Pass, 63/05/14, JW, ♂ *1183* (UZM); *1184* (MEI); 1.5 km W, 64/04/26, JD, ♀ *1181* (MEI); WJT, ♂ *1182* (MEI).

Acknowledgments

The following people and institutes are gratefully acknowledged for their assistance in the preparation of this manuscript: Dr. E. I. Schlinger, University of California, Berkeley for encouragement, critical comments and suggestions; Dr. P. A. Rauch, University of California, Berkeley, for helpful suggestions and the data management system; Mr. Joe Wilcox, University of California, Riverside for identification of the Asilidae; and my wife Bonnie, for her enduring patience.

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